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INFORMATION TRANSMISSION:
A FUNCTION OF ORGANIZATION

by

Duane D. Pettersen

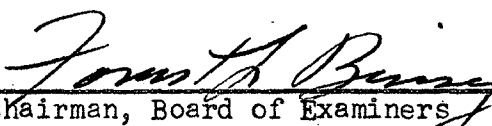
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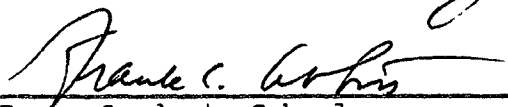
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1963

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CHAPTER I

STATEMENT OF THE PROBLEM

"Communication means that information is passed from one place to another,"¹ says Miller, and "the spread of information through a group of people is one of the most important social events that can occur."² The communication of information is probably the only method by which man can understand society and make his adjustments to the environment in which he lives. Therefore there is an ever increasing demand for knowledge about the factors which influence the transmission of information.

Behaviorally, the communication of information from one individual to another is based upon a specific purpose, stated in terms of receiver responsiveness. Effective transmission of information may be assessed in terms of the degree of relationship between the transmitter's purpose and the actual receiver response.

Of the many factors that presumably affect the amount of information communicated between two individuals, one commonly recognized is the organization of a message. The remainder of this chapter will consider the nature of organization and its effect upon information transmission.

¹George Miller, Language and Communication (New York: McGraw-Hill Book Company, Inc., 1951), p. 6.

²Ibid., preface v.

The Concept of Organization

Literature in the field of public address reveals a common conclusion that organization is in some sense or another a requirement for effective formal speaking. Statements such as "the need to organize is a self-evident fact,"³ "everyone is agreed that the parts of a speech should be put together in an orderly manner,"⁴ and "well-organized speech helps everyone,"⁵ indicate the significant role which organization is assumed to play in the process of communication. Similar views are expressed by Robinson,⁶ Mudd and Sillars,⁷ and Mills.⁸

However, when available literature is reviewed for evidence derived from controlled studies of the effects of organization, there are relatively few investigations, all employing dissimilar procedures, such that strict comparison of results would be of questionable validity.

Investigators have studied several aspects of the concept of "organization." Some studies include the order of presentation of main ideas, and the use or non-use of topic sentences, others have been

³Wayne Minnick, The Art of Persuasion (Boston: The Riverside Press, Cambridge, 1957), p. 262.

⁴Lester Thonssen and Howard Gilkinson, Basic Training in Speech (Boston: D.C. Heath and Co., 1947), p. 17.

⁵James McBurney and Ernest Wrage, Guide to Good Speech (2d ed.; New York: Prentice-Hall, Inc., 1960), p. 76.

⁶Frederick Robinson, Effective Public Speaking (Chicago: LaSalle Extension University, 1915), p. 17.

⁷Charles Mudd and Malcolm Sillars, Speech: Content and Communication (San Francisco: Chandler Publishing Co., 1962), p. 9.

⁸Glen Mills, Composing the Speech (New York: Prentice-Hall, Inc., 1952), pp. 107-108.

concerned with transitions, and beginning and concluding summaries. The studies reported on the following pages are investigations of the structure of a message in its entirety--i.e., the investigators "disorganize" all segments of a message. Six studies of this nature have come to the writer's attention.

Smith⁹ employed nine arrangements of seven parts (introduction, conclusion, three main issues, and two transitions) of a twelve minute speech opposing the practice of drinking alcoholic beverages. He found that the "normal" order speech resulted in a positive shift in attitude, parallel to that indicated by the arguments of the speech. The randomized speech resulted in a negative or inverse audience reaction to the direction indicated by the arguments. When only two or three parts of the speech were interchanged, a less positive shift resulted. Following the speech Smith asked the subjects a question concerning the structure of the speech and concluded that the audience could tell which speech was organized and felt the normal order speech to be more effective.

Prior to the above study, Smith¹⁰ had reported results of a graduate seminar study which indicated that listeners retain as many facts from a short unorganized speech as from the same speech when organized. Procedural matters were not reported.

⁹Raymond Smith, "An Experimental Study of the Effects of Speech Organization Upon Attitudes of College Students," Speech Monographs, XVIII (1951), 292-301.

¹⁰Ibid., p. 292.

Beighley¹¹ investigated the relationship between information transmission of a highly organized speech and the same speech when paragraphs were randomized. Two experimental speeches were employed: an "easy" speech and a "hard" speech. The "easy" speech was distinguished from the "hard" speech by two methods: (1) Beighley found that the "hard" speech contained approximately a two-to-one ratio of abstract ideas to concrete facts, while the "easy" speech had the opposite balance; and (2) the "easy" speech, checked through the use of the Dale Formula¹² for determining difficulty of reading material, was rated as ninth-tenth grade reading-level, and "hard" speech at the thirteenth-fifteenth grade reading-level.

Results from a thirty-item multiple choice test indicated that "organization shows no statistically dependable superiority for comprehension over the kind of disorganization used,"¹³ and that the "easy" speech resulted in a greater comprehension level of listeners than did the "hard" speech.

A second study by Beighley,¹⁴ who employed similar procedures

¹¹K.C. Beighley, "An Experimental Study of the Effect of Four Speech Variables on Listener Comprehension," Speech Monographs, XIX (1952), 249-58.

¹²Edgar Dale and Jeanne Chell, "A Formula for Predicting Readability," Educational Research Bulletin, XIX (1948), pp. 11-20.

¹³Beighley, p. 258.

¹⁴K.C. Beighley, "An Experimental Study of the Effect of Three Speech Variables on Listener Comprehension," Speech Monographs, XXI (1954), 248-53.

but different subjects, confirmed his earlier study which indicated no statistical significance between a highly organized message and a message with randomized paragraphs.

Thompson¹⁵ wrote a ten minute speech which was labeled "adequately structured" by a panel of expert judges. The sentences of the speech were then randomized within eight main points of the message in order to form a second speech labeled "moderately structured." A third speech, labeled "grossly unstructured," consisted of randomizing sentences within the original order of the three main divisions of the initial speech.

Subjects were classified as "high scorers" or "low scorers" according to performance on the "Goyer Organization of Ideas Test" which attempted to determine subject's ability "to organize ideas in what would generally be considered the most meaningful way."¹⁶ Results indicated that on a twenty-nine item multiple choice test, "high scorers" retained more information than "low scorers" for all three levels of organization of the message. And further, that when the subject's level of ability in organization was controlled, the more adequately structured speeches transmitted more information than those messages which were less adequately structured. Thompson concluded that "both organizational structure and listener's level of ability in organization appear to influence the retention of a communication."¹⁷

¹⁵Ernest Thompson, "An Experimental Investigation of the Relative Effectiveness of Organizational Structure in Oral Communication," The Southern Speech Journal, XXVI (1960), 59-69.

¹⁶Ibid., p. 59.

¹⁷Ibid., p. 61.

The following general hypothesis was tested by Darnell: "Successive steps of removal from a because order (a second sentence is logically subordinate to the first) will reduce the accuracy of respondents' predictions about the missing parts of the message."¹⁸ A message of fifteen sentences was given seven treatments or levels of organization. The organization of message seven, is the maximum distance from a "right" order or contained sentences which were as "mixed" up as possible.

The criterion for testing the subject's comprehension was the Cloze procedure, which was defined by its originator as "a psychological tool for gauging the degree of total correspondence between (1) the encoding habits of transmitters and (2) the decoding habits of receivers."¹⁹ The procedure was to systematically delete words from a message from a random start. Uniform blanks replaced the deleted words and subjects were to reproduce the deleted words. A subject's Cloze score was determined by the number of correct words he reproduced.

Darnell found that differences were statistically significant between the seven forms of the message and that the differences were in the expected direction.

From the Smith and Thompson studies there was an indication that a positive relationship occurred between the amount of information transmitted and the level of organization in a message. Darnell reported a similar relationship between a deletion-completion test and the level of organization. There is reason to assume that if more words are completed when a message is highly organized then when the message is less organized,

¹⁸Donald Darnell, "The Relation Between Sentence Order and Comprehension," Speech Monographs, XXX (June, 1963), 97-100.

¹⁹Wilson Taylor, "Application of 'Cloze' and Entropy Measures to the Study of Contextual Constraint in Samples of Continuous Prose," unpubl. diss. (Illinois, 1954), p. 3.

then a subject listening to a highly organized message, would also be able to answer more questions correctly on an information test. With this assumption, Darnell's study may support the conclusions of Smith and Thompson. However, the seminar study in which Smith participated and the two studies reported by Beighley appear to be inconsistent with this conclusion.

At least one possibility might reasonably account for the findings by Beighley; each question on the test was taken from a single paragraph. In his study it was not necessary for subjects to recall or recognize information from two or more randomly positioned paragraphs in order to respond correctly to a single multiple choice question, but rather only isolated information was required. If a subject had to compile information from more than one position in the message in order to respond correctly to a question, it would be plausible that subjects listening to a "disorganized" message, would not be able to answer as many questions correctly. Beighley's results might, therefore, support the conclusion drawn in the previous paragraph.

The present investigation differs from the investigations reported above in two major aspects. The first concerns the procedure by which an initial message was organized. Previous investigators presumably followed one of many general outlines for organizing their messages. Their messages were then subjected to a panel of expert judges who were to determine which message, the original or the "disorganized," was more highly organized. However, in this investigation, an organizational model was employed. The model, to which the organized message corresponds, is based upon certain hypotheses regarding the perception of objects and other nonverbal events.

A second procedure by which this investigation differs from previous investigations, pertains to the method of assessing the amount of information transmitted. Smith and Thompson, as well as Beighley employed what may be referred to as verbal criteria--i.e., responding verbally to specific questions concerning the content of the experimental messages. A behavioral criterion was employed to assess information transmission for this investigation. This criterion required subjects to respond nonverbally to a given message by reproducing a display or design which was described by the message. Since how one responds behaviorally is not always consistent with his verbal response, one objective of this study was to observe the amount of information transmitted by a message as assessed by subjects' nonverbal response to the message.

These procedural differences, indicate the desirability for investigation of the factor of organization in messages, and of the nonverbal assessment of the amount of information transmitted.

An Organizational Model

One approach to analyzing the nature of organization is to examine the relevant factors affecting the manner in which an individual perceives the world. Major determinants influencing one's perceptions, state Krech and Crutchfield,²⁰ are structural factors of nonverbal objects and events. Structural factors are those factors derived "solely from the nature of the physical stimuli and the neural effects they evoke in the nervous system of the individual."²¹

²⁰David Krech and Richard Crutchfield, Theory and Problems of Social Psychology (New York: McGraw-Hill Book Co., Inc., 1948), p. 81.

²¹Ibid., p. 81.

The following examples illustrate how structural factors influence the way in which an individual perceives the world. These examples are taken from Krech and Crutchfield. The authors indicate that these structural factors provide at least some organizational patterns available to communicators. They do not, however, attempt to confirm the hypotheses of perceptual organization with experimental evidence. However, summaries of available experiments may be found in books by Koffka,²² Köhler,²³ and Ellis.²⁴

Proposition I states that "the perceptual and cognitive field in its natural state is organized and meaningful."²⁵ In other words, the world "out there" is not a "blooming, buzzing, confusion," but that all cognitive fields of an individual are organized and meaningful.

An example of an illustration of a perception of two horizontal groupings, and probably not five vertical groupings or ten individual dots is indicated by the following:

```

a  b  .  .  .
.  .  .  .  .
c  .  .  .  .

```

The suggestion is plausible that this "forced" organization of physical dots is due to their spatial relationships and relatively independent of functional factors such as wants, needs, or past learning. Such factors are called structural factors of perception.

²²Kurt Koffka, Principles of Gestalt Psychology (New York: Harcourt Brace, 1935).

²³Wolfgang Köhler, Gestalt Psychology (New York: Liveright, 1957).

²⁴W.D. Ellis, A Source Book of Gestalt Psychology (New York: Harcourt Brace, 1938).

²⁵Krech and Crutchfield, p. 84.

Proposition II, and probably the most significant proposition for the purpose of this investigation, states that "objects or events that are close to each other in space or time or resemble each other tend to be apprehended as parts of a common structure."²⁶ The hypothesis is concerned with two concepts; that of "proximity" and of "similarity." The following example illustrates the concept of proximity, i.e., that those objects which are close together in space (proximity) tend to be organized together in perception:

```

a . c . * .
  . * . * .
  . * . * .
  . * . * .

```

The concept of similarity suggests that dot ^aA is perceived as belonging to dot ^bB rather than dot C simply because A is more similar (in shape) to B than to C. Likewise the example is perceived as consisting of five columns of substructures rather than four rows.

It is important to note that the hypotheses pertaining to proximity and similarity are defined in terms of perception, i.e., those objects that are perceived to be close to each other or similar to each other will be organized together with other perceptions to make up one cognitive structure.

The hypotheses mentioned in the last four paragraphs, would appear to be further emphasized by two social habits which contribute to the way in which an individual perceives the world. These habits may be learned

²⁶Ibid., p. 102.

from methods of reading and telling time on a clock. Both of these influence man's perceiving objects from left-to-right and from top-to-bottom. According to Munn, the factor of past experience, or habit factor, such as reading habits, "accounts for different ways in which different individuals perceive certain identical external situations."²⁷

Black and Moore indicate that since one has learned to talk, he has also learned to organize.²⁸ This contention would likewise seem to be supported by Krech and Crutchfield's first proposition of organization stated above. It has also been indicated that one objective of communication is to transmit information. It is therefore, probably desirable that a transmitter take into consideration the perceptual habits of his prospective receivers and that he choose a pattern of organization which is consistent with those structural patterns familiar to his receivers.

The conception of organization as developed above will be employed in Chapter II as a model for organizing an experimental message.

Statement of the Problem

One factor which has been assumed to affect the way in which an individual responds to a verbal message, was organization. Related to the foregoing discussion and in light of the experimental evidence reported, it was the intent of this study to examine the effects of three messages,

²⁷Norman Munn, Psychology: The Fundamentals of Human Adjustment (3rd. ed.; Boston: The Riverside Press, 1956), p. 322.

²⁸John Black and Wilbur Moore, Speech: Code, Meaning, and Communication (New York: McGraw-Hill Book Co., Inc., 1955), p. 183.

representing three levels of organization, upon the amount of information transmitted.

The hypothesis which governed this investigation was that there was a positive relationship between information transmission and the level of organization of a message. This directional hypothesis stated that of three levels of organizational structure, the most highly organized message would communicate the most information; the moderately organized message would communicate less information; and the least organized message would result in the least information communicated. The procedures described in the following chapter were employed in testing this hypothesis.

CHAPTER II

INTRODUCTION

The following general procedure²⁹ was employed in measuring the effects of three test messages. The messages represent three levels of organization. The original experimental message was constructed such that the organization of the message would be consistent with the hypotheses about organization described in Chapter I. Another message was constructed by randomizing sets of four sentences of the initial message, and a third message was constructed by randomizing each sentence of the initial message. Each of the three messages was presented to a different audience by means of a tape recorder. Individuals in the audience were tested after the presentation of the messages relative to their ability to reproduce the visual display described by the messages.

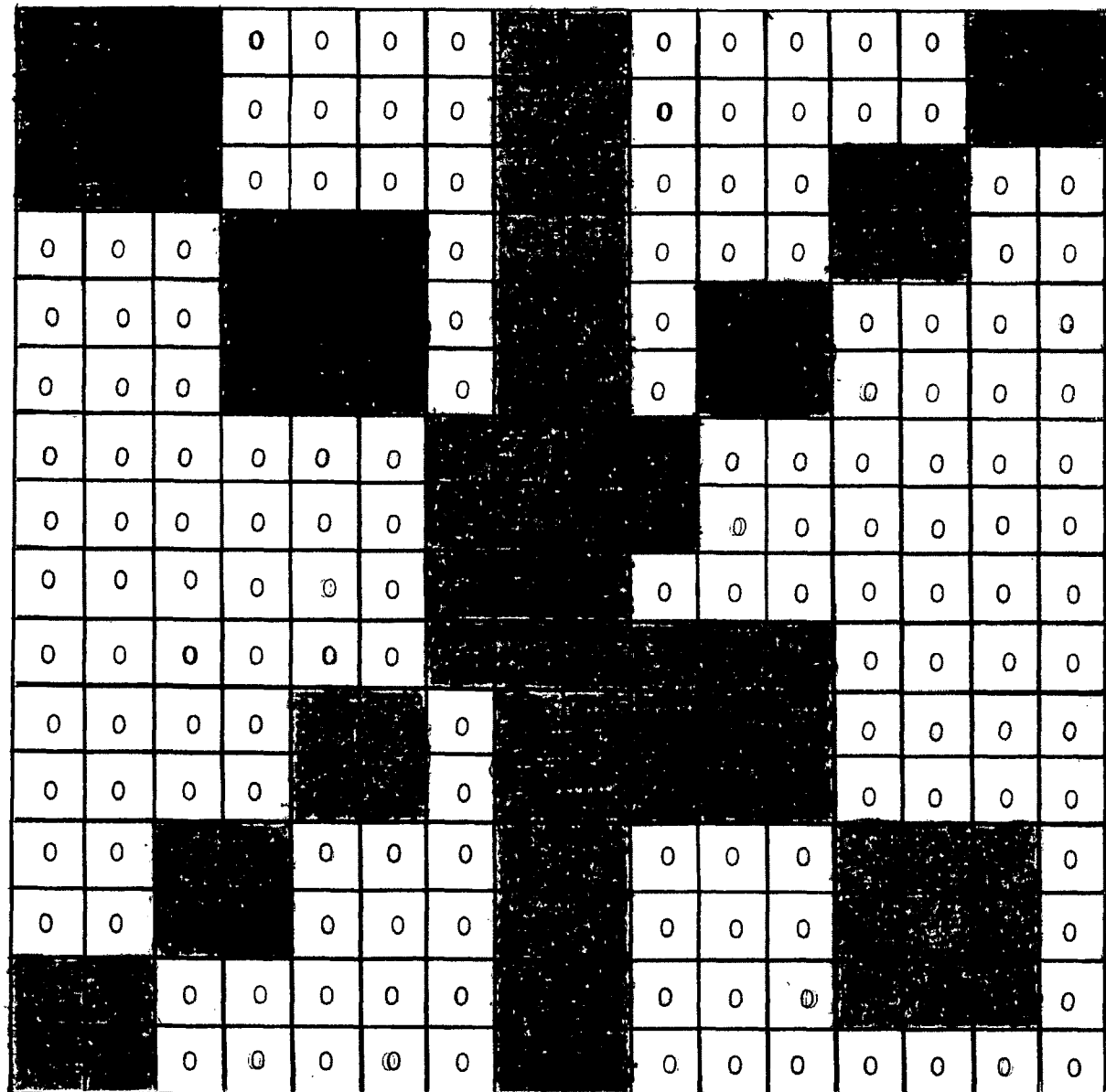
The Display

The experimental display which is constructed on a matrix sixteen squares by sixteen squares in size, is shown in Fig. 1. The display is construed to represent three sets of related geometrical figures. As might be seen from observing Fig. 1, one figure lies on a diagonal from upper left to lower right; one figure lies on a vertical axis; and,

²⁹The procedures employed were based on a conception of communication and, with modifications, the experimental approach developed in conjunction with a series of experimental investigations of communication sponsored by the Air Force Office of Scientific Research (F.L. Brissey, principal investigator).

Fig. 1

The Experimental Display



one figure lies on a diagonal from upper right to lower left. The above imposed construction upon the display is based upon the concepts of similarity and proximity, and the concept of "good continuation." The concept of similarity indicates that similar items or relationships tend to be perceived as one unit while the concept of proximity is concerned with a gestalt perception of items that are near to each other. The concept of good continuation states that "organization in perception tends to occur in such a manner that a straight line appears to continue as a straight line, a part circle as a circle, and so on, even though many other kinds of perceptual structuring would be possible."³⁰

The Messages

Three messages were constructed, each containing twenty-four sentences about the display shown in Fig. 1. Each sentence was a simple statement of fact which reported something about the visual display. The process of organization, as conceptualized, was employed as a model by which the sentences of the message were consistently arranged.

The purpose of organizing the experimental message according to the model discussed in the preceeding chapter, was to increase the probability that upon hearing the message, individual receivers would be more able to accurately reproduce the display. Thereby, qualities were chosen which the writer felt would maximize the probability of obtaining the desired response, i.e., obtaining duplicate copies of the display from receiver subjects.

³⁰Ernest Hilgard, Theories of Learning (2d ed.; New York: Appleton-Century-Crofts, Inc., 1956), p. 227.

The first organizational quality was concerned with the "position" of the three geometrical figures of the display. The figure on the left running from upper left toward the lower right was to be described first in the message; the figure running vertically from the upper middle to the lower middle was to be described next in the message; and, the figure running from upper right to lower left was to be described last in the message.

The above sequential description of the figures of the display was chosen for the reason that it was analogous to two habits of people in this country. First, was the habit of reading from the written page which in the English language is read from left to right. A second reason was indicated by the familiar rotation of the hands of a clock: a clock-wise, left to right and top to bottom, direction. It was indicated in the first chapter that the habit factor was a strong determinant affecting the ways in which individuals perceived certain identical external situations. Therefore, by describing the figures in the above manner the message was assumed to maximize the likelihood of achieving the investigator's purpose.

A second quality employed in the organization of the sentences about the three figures of the display, was based upon the hypotheses of visual perception. It was earlier stated that the concepts of similarity, proximity, and good continuation resulted in perceiving the display as three geometrical figures. These same concepts indicated that once attention was directed to the upper left hand corner, one's attention followed the entire figure from upper left to lower right. It was evident that once attention was directed to the figures in the upper left, upper middle,

and upper right, respectively, the factors of cognitive organization presumably resulted in attention being "carried through" each figure. Therefore, all characteristics of one figure should be described before a second figure was described.

One further development should be noted: any sentence about an individual square of the figures should appear before sentences about relationships between elements of the figures. This quality merely reflects that relationships such as "corner-to-corner" or "stair-step-fashion" which appear in the experimental message, may be meaningless if the characteristics of the individual elements of the figures were not known.

It was assumed that the above concepts employed for organizing sentences of a message would result in a maximum probability that the visual display would be reproduced. The initial message, Message I, organized in a manner consistent with hypotheses about visual perception, is reported in Fig. 2.

A second message was to be less organized than the first and therefore sets of four sentences of Message I were randomized according to a table of random numbers. This method required Set 1 to consist of sentences 1, 2, 3, and 4 of Message I; Set 2 consisted of sentences 5, 6, 7, and 8 of Message I; etc. Message II was organized with the following order of sets: 6, 2, 5, 3, 1, 4. This message is reported in Fig. 3.

The third message, reported in Fig. 4, was organized by numbering all sentences of the original message and then randomizing the sentences according to a table of random numbers. The numbered sentences of Message I

Fig. 2

MESSAGE #1: Highly Organized

A sequence of squares is located on a diagonal running from left to right. This sequence begins in the upper left hand corner of the checkerboard. It runs towards the lower right hand corner. In the upper left corner is a three by three square. This square comprises nine square units of the checkerboard. Four more of these three by three squares are located in this sequence. Therefore, in this figure there are five associated squares. The squares of the sequence are positioned corner to corner on the diagonal. They run in a stair-step fashion towards the lower right hand corner of the checkerboard. The lower right hand corner does not allow room for a full square.

Another figure of this display is located on a vertical axis. This axis is located in the exact middle of the checkerboard. That is, the figure comprises the eighth and ninth columns of square units. The sequence is two units wide. The figure forms a solid vertical column.

The third figure is a sequence of squares located on a diagonal running from right to left. This sequence begins in the upper right hand corner of the checkerboard. It runs towards the lower left hand corner. In the upper right corner is a two by two square. This square comprises four square units of the checkerboard. Seven more of these two by two squares are located in this sequence. Therefore, in this figure there are eight associated squares. The squares of the sequence are positioned corner to corner on the diagonal. They run in a stair-step fashion towards the lower left hand corner of the checkerboard.

Fig. 3

MESSAGE #2: Moderately Organized

Seven more of these two by two squares are located in this sequence. Therefore, in this figure there are eight associated squares. The squares of the sequence are positioned corner to corner on the diagonal. They run in a stair-step fashion towards the lower left hand corner of the checkerboard. This square comprises nine square units of the checkerboard. Four more of these three by three squares are located in this sequence. Therefore, in this figure there are five associated squares. The squares of the sequence are positioned corner to corner on the diagonal. This sequence begins in the upper right hand corner of the checkerboard. It runs towards the lower left hand corner.

In the upper right corner is a two by two square. This square comprises four square units of the checkerboard. They run in a stair-step fashion towards the lower right hand corner of the checkerboard. The lower right hand corner does not allow room for a full square.

Another figure of this display is located on a vertical axis. This axis is located in the exact middle of the checkerboard. A sequence of squares is located on a diagonal running from left to right. This sequence begins in the upper left hand corner of the checkerboard. It runs towards the lower right hand corner. In the upper left corner is a three by three square. That is, the figure comprises the eighth and ninth columns of square units. The sequence is two units wide. The figure forms a solid vertical column. The third figure is a sequence of squares located on a diagonal running from right to left.

Fig. 4

MESSAGE #3: Least Organized

The third figure is a sequence of squares located on a diagonal running from right to left. Therefore, in this figure there are five associated squares. The lower right hand corner does not allow room for a full square. The squares of the sequence are positioned corner to corner on the diagonal. The figure forms a solid vertical column. Another figure of this display is located on a vertical axis. It runs towards the lower left hand corner. Seven more of these two by two squares are located in this sequence. That is, the figure comprises the eighth and ninth columns of square units. Four more of these three by three squares are located in this sequence.

This sequence begins in the upper right hand corner of the checkerboard. Therefore, in this figure there are eight associated squares. This sequence begins in the upper left hand corner of the checkerboard. They run in a stair-step fashion towards the lower right hand corner of the checkerboard.

In the upper right corner is a two by two square. It runs towards the lower right hand corner. The sequence is two units wide. This square comprises four square units of the checkerboard. This axis is located in the exact middle of the checkerboard. The square comprises nine square units of the checkerboard. They run in a stair-step fashion towards the lower left hand corner of the checkerboard. The squares of the sequence are positioned corner to corner on the diagonal. A sequence of squares is located on a diagonal running from left to right. In the upper left corner is a three by three square.

appeared in the following sequential order in Message III: 16, 7, 10, 23, 15, 11, 18, 21, 13, 6, 17, 22, 2, 9, 19, 3, 14, 20, 12, 5, 24, 8, 1, 4. This message represented the least organized structure of the three messages.

The messages were each approximately two minutes in length, contained twenty-four simple statements of fact, and described an identical display of three geometrical figures. A graduate student in speech at Montana State University read all three messages. The student was chosen for qualities normally considered desirable in a speaker. Each message was taped and later played before subjects of the investigation. The recorder used in taping the messages and instructions was a Webcor, model number EP2001-1A, played at a speed of seven and a half inches per second.

The Procedure

An identical procedure was followed for all three sections of subjects. This procedure consisted of (1) outlining a method for arranging subjects in their respective test rooms, (2) having subjects fill out Data Sheets, (3) testing audibility of taped messages, (4) playing a set of instructions, (5) playing one of three messages, and (6) having subjects reproduce the display. These procedures will be discussed below.

(1) All subjects of the study were assigned by a table of random numbers to one of three sections and were to report to a designated room at a specific time. Each subject was given a Data Sheet to fill out completely and was then assigned to one of three test rooms. Subjects were asked to sit in every other seat in the room with the first person of each row seated in the first seat of each row and directly behind the

person in front of him. In that way all subjects were seated in columns and two seats away from subjects on either side.

(2) The Data Sheet, Appendix A, was completed by each student prior to hearing the message. Data from subjects listing a problem in hearing were eliminated.

(3) In order to test the audibility of the taped instructions and messages, a pretest tape was played at which time the volume was adjusted according to indications of the subjects. Subjects were asked to raise their hands if they were unable to comfortably hear and to clearly understand the message. The tape consisted of the following message:

You are about to participate as subjects of an investigation in listening. If you are not able to comfortably hear this message or clearly understand it, please raise your hand.

(4) Following the pretest tape a set of instructions was played to indicate the procedure subjects were to follow after hearing one of the messages. The instructions were as follows:

You are about to hear a message that describes an arrangement of square units on a matrix. (A sample matrix is shown to the group at this time). After you have heard the message you will be given a matrix with a blank sheet of yellow paper clipped to it. Consider each square unit of the matrix. If it is a part of the arrangement described by the message, shade in the square. If the square unit is not a part of the arrangement described by the message, mark a zero (0) in the middle of the square. Be sure to consider each square unit of the matrix and then either shade in the square if you think it is part of the arrangement, or mark a zero if you think it is not part of the arrangement. Keep your work covered with the yellow sheet of paper as much as possible. Use only the indelible pencil to shade the squares or mark zeros in the squares.

Are there any questions?

Remember, you are to use the indelible pencil only; and you are to keep your paper covered. Shade in the squares which are a part of the arrangement; mark a small zero if the square is not a part of the arrangement. Remember, you are to shade in, or place a zero in all square units of the matrix. You are not timed, therefore, take all the time you need to finish the display.

(5) Immediately following the instructions tape, one of three messages was played before each audience of approximately twenty-five male subjects. Each audience consisted of subjects randomly selected by a table of random numbers from the volunteer subjects.

(6) A Score Sheet, a sixteen by sixteen matrix with a blank sheet of paper clipped to the matrix, was passed out to each subject following the message tape. Each subject was told to reproduce the display that the message described--i.e., each subject was to shade in those squares he thought were part of the display described, and mark a zero in those squares not thought to be part of the display. No time limit was set in which the task was to be completed. When subjects had finished the display, they were asked to turn their papers over and to remain quietly until all were finished with the task.

The Subjects

Undergraduate male college students, enrolled at Eastern Montana College of Education, Billings, Montana, were employed as subjects for this investigation. Each subject who volunteered from one of several classes visited by the investigator, was given a three by five card upon which was written a number and the time and place of the experiment. Subjects were then randomly assigned to one of three sections according to the number on their card.

Phase II Procedures

Two characteristics of the procedures described above were judged to be inadequate in that several irrelevant variables may have influenced the data received. A second experiment was therefore conducted employing the following revised procedures. Hereafter the first experiment will be labeled, Phase I, and the second experiment, Phase II.

The instruction were judged to be unclear in terminology and grammatical structure. Detailed discussion of these factors are described in Chapter IV. The following set of revised instructions was used for Phase II:

PRETEST TAPE: You are about to participate as subjects in a study of listening. Obtain a relaxed position but remain mentally alert while listening to the following messages. If you are NOT able to comfortably hear this message or clearly understand it, please raise your hand.

INSTRUCTIONS: The message which you are about to hear describes an arrangement of squares on a checkerboard sheet of paper like this: (Pause ten seconds--show matrix to subjects). After you have heard the message you will be asked to reproduce the arrangement of squares. Consider each square unit on the checkerboard. If a square is a part of the arrangement described by the message, shade in that square; if the square unit is NOT a part of the arrangement, mark a zero (0) in the middle of the square. Do NOT, I repeat, do NOT change any decision after you have once marked a square unit. After you have considered a square unit of the checkerboard, shade in the unit if it is a part of the arrangement described by the message; mark a zero in the square unit if it is not a part of the message. Please keep your work covered with the yellow sheet of paper at all times.

Are there any questions?

Remember, you are to reproduce the arrangement of squares described by the following message. Consider each square unit on the checkerboard. If it is a part of the arrangement described, shade in the square unit; if it is not a part of the arrangement described, mark a zero in the unit. Do not change any markings on the checkerboard. Keep your paper covered. This is not a speed test. Take all the time you need to complete the checkerboard.

Again, are there any questions?

You will now listen to the following message. Remember-- shade in the square units described by the message. Mark a zero in the square units NOT described by the message.

A second factor influencing the decision to conduct Phase II of this experiment, was related to the nature of the subjects employed for Phase I. Again these details are described in Chapter IV. The new set of subjects was sixty high school students between the ages of fifteen and seventeen, who were attending a three week Speech Camp at Montana State University. These students, thirty-three males and twenty-four females, came from the upper third of their respective classes throughout high schools of Western United States.

All subjects had actively participated in speech activities in their high schools and were now participating in competitive speech events at the University. It was felt that the group was relatively homogeneous with respect to attitude, interests, and age level.

The sixty subjects were randomly assigned to three experimental groups by a table of random numbers. McCarthy,³¹ Templin,³² and Schuell³³ indicate that females tend to score higher on language comprehension tests. Subjects of Phase II were therefore, reassigned as follows: eleven males to each group and nine females to each group.

³¹D. McCarthy, Manual of Child Psychology, ed. L. Carmichael, (New York: Wiley, 1945), Chapter 10.

³²M. Templin, Certain Language Skills in Children (Minneapolis: University of Minnesota Press, 1957).

³³Hildred Schuell, "Sex Differences in Relation to Stuttering," Journal of Speech Disorders, 12:294-95 (1946).

It was felt that if a constant ratio existed between males and females, differences in language skills would not contribute to biased data received from the study.

The method of reassigning an equal number of males and females to each group necessitated performing the following operations after all subjects had previously been randomly assigned: two females from group one were exchanged at random with two males of group two; and one female of group three was exchanged with one male of group two. Each group then contained eleven males and nine females.

The Scoring Procedure

The criterion test described earlier was administered to the members of each group immediately following the playing of the taped message. The relative degree to which a subject was informed was assumed to be represented by the number of correct responses made on the matrix. The subjects were instructed to consider each square of the matrix and place one of two marks in each square. A correct response consisted of a "shaded" square which was a part of the described display and a zero (0) placed in a square which was not a part of the display. False or incorrect items were not employed in the analysis largely because when every subject attempts every item, the correction operation of scoring Rights minus Wrongs would be of no value.³⁴

³⁴J.P. Guilford, Fundamental Statistics in Psychology and Education (New York: McGraw-Hill Book Co., Inc., 1956), p. 480.

The statistical method was the nonparametric analysis of variance³⁵ which was used to evaluate differences between the sums of ranks for each of the three groups. A rank ordering of performance scores of subjects was obtained and therefore the ordinal level of measurement was achieved. And, as the procedures employed in this investigation were exploratory with respect to the organizational model, the behavioral criterion, and the method of "disorganizing" the messages, the level of significance for testing the experimental hypothesis was set at ten percent.

³⁵Sidney Siegel, Nonparametric Statistics (New York: McGraw-Hill Book Company, Inc., 1956), pp. 184-194.

CHAPTER III

RESULTS

Information transmitted by a message under conditions of three levels of organization as described in the preceding chapter, was empirically assessed by means of displays reproduced by subjects on matrices. Each reproduction of the visual display was scored by counting the total number of correct responses with a maximum possible score of 256. The total number of individual scores for the groups listening to the three messages was then assigned ranks with the smallest score receiving the rank of one, the next smallest score, the rank of two, and the largest score receiving the highest rank.

The hypothesis governing this investigation was that there would be a positive relationship between the level of organization and the amount of information transmitted--i.e., the message considered highly organized would transmit the most information; the message considered moderately organized would transmit less information; and, the message considered least organized would transmit the least information.

Two phases of the study were conducted with Phase II employing slightly different procedures than Phase I: the instructions were rewritten, a new set of subjects was employed, and a different graduate student read the messages and the instructions. Phase I employed fifty-five undergraduate college males. Subjects were randomly assigned as follows: Message I--17; Message II--18; and Message III--17. Two subjects did not appear for the experiment and five subjects were excluded from the analysis

of data because they did not follow directions. This resulted in Messages I, II, and III containing 13, 15, and 17 subjects, respectively.

Phase II employed sixty subjects made up of male and female high school students. Twenty students were randomly assigned to each of the three messages. Because of the possible differences between male and female performances (see page 25), some subjects of the three groups were reassigned so that eleven males and nine females were in each group. Three females were excluded from the data of the Message I group for not following directions.

The data for each of the three groups of Phase I and Phase II were then analyzed for statistical significance by the Kruskal-Wallis One-Way Analysis of Variance. Significant results were obtained for both phases at the .10 level of significance for a one-tailed test, which was the level set for testing this hypothesis.

The analysis for Phase I gave an H of 7.5675, where an H of 4.60 is required for significance at the .10 level with two degrees of freedom. Median scores for the three groups of Phase I were as follows: the highly organized message--220; the moderately organized message--176; and, the least organized message--185. The least organized message, or Message III, had a larger median than Message II.

The Mann-Whitney U Statistic was used to test significances between each pair of the three groups. Between Messages I and II, and between Messages I and III, U was significant at the .10 level of significance; however, between Messages II and III, the moderately organized and the least organized messages, U was not significant at the required level.

Data from Phase I of this investigation partially supported the experimental hypothesis that Message I, the highly organized message,

would transmit more information than either of the other two messages. As the difference between Message II and Message III was not significant, the null hypothesis cannot be rejected.

Phase II of this investigation, which employed a different group of subjects, instructions, and speaker, yielded an H of 12.049 where an H of 4.60 was required for significance at the .10 level on a one-tailed test. Median scores for Messages I, II, and III were 234.0, 186.5, and 178.5, respectively. A Mann-Whitney U gave significant differences between all Messages at the required .10 level of significance, thus, a positive relationship occurred between the amount of information transmitted and the level of organization of the messages.

Incidental data obtained from Phase II concerned a comparison of twenty-four female subjects with thirty-three male subjects participating in the three groups. Although this analysis was not an objective of the present investigation, results of a Mann-Whitney U Test indicate that displays produced by females were more accurate than those of males. This difference was statistically significant at the .10 level; however, differences between males and females of any one group were not found to be significant at the .10 level.

Implications of the procedures and results of this study will be discussed in the following chapter.

CHAPTER IV

DISCUSSION

The intent of this experimental study was to assess the relationship between information transmitted and the organizational level of a message. The research hypothesis stated that more information would be transmitted by a "highly" organized message than a message containing a lower level of organization. A message was considered "highly" organized in that the relationships among the sentences of the messages were consistent with certain hypotheses of visual perception and reading habits of English speaking peoples. The hypothesis was tentatively confirmed.

Phase I

Data obtained from Phase I of this investigation did not entirely support the research hypothesis in that the difference in the amount of information transmitted by Messages II and III was not statistically significant. Upon examining the procedures under which this study was conducted, two possibilities might reasonably account for the obtained results--specifically, the reason for the non-significant difference between the amount of information transmitted by Messages II and III.

The first factor is related to the concepts of "motivation" and "attitude," of which the following characteristics seem to be attributable. The experiment was to have been conducted two weeks prior to final examination week at another educational institution. However, examinations had been moved ahead one week which actually required that

the experiment be conducted three days before the first day of examinations.

Fifty-two subjects volunteered for the experiment although the experimental design planned for seventy-five subjects. About a fourth of the fifty-two subjects were obtained only after particular instructors indicated that if a subject volunteered, the participation might be looked upon favorably when grades are given out to those individuals who are borderline cases. Another factor which certainly reduced the number of participants, was the fact that subjects would have to return to the school campus in the evening; also, students who had night classes and students who held jobs, were not able to participate.

Although these factors cannot be assessed objectively as to their particular effect upon the results of Phase I, they presumably had some influence; these factors contributed to the decision to conduct a second study under conditions where the above variables might be more effectively controlled.

A second factor which might reasonably account for the results of Phase I, is the set of instructions which was played by tape to all three groups of receivers. The first indication of the inadequacy of the instructions was noted when subjects asked several questions of the following nature after the instructions tape had been played: "Is the message going to say which squares to shade in?"; "Are we supposed to fill in all squares?"; "I don't get it!"

As a result of these questions, each monitor of the three groups attempted to explain and answer each question effectively to the extent with which he was familiar with the procedure. Presumably, at least five subjects had not clearly understood the task which they were to

perform as five subjects had to be excluded from the analysis for failing to follow directions; the subjects did not place zeros in the squares which were not part of the display.

Examining the set of instructions revealed that at least one word, "matrix," may have been unfamiliar to some subjects, even though an example of a matrix was shown to all subjects. It was also noted that the particular task of reproducing the described display was not specified--two phrases employing the word "reproduce" were added to the instructions of Phase II. Another observation indicated that perhaps the instructions were too concise and repetitious. This may have resulted in subjects not being able to shift their attention quickly enough from one direction to another in the instructions, and therefore did not receive the information relevant to the precise task confronting them. As noted earlier five subjects were excluded from the analysis because they did not follow specific directions.

For Phase II of this experiment, the word "matrix" was changed to "checkerboard," and a number of sentences were reworded. Five additional sentences were written in order to clarify and improve specific instructions.

The above factors, "motivation-attitude," and the set of instructions, were possible influences on the obtained results.

In relation to the "motivation-attitude" factor mentioned previously, it is noted that the Phase II subjects appeared to be less variable in performance than the Phase I subjects. One measure of variability which suggests this condition is range. Range represents the difference between the highest and lowest scores in a series. The range for Message II, Phase I, was 117 while for the same message in

Phase II, the range was 60. Similarly, for Message III, Phase I, the range was 118, while for Message III, Phase II, the range was 53. (The range of 53 excludes one score of 98 which would have made this range, 100. Other scores for all four messages were closely grouped around the median). However, ranges for Message I of each Phase were reversed--i.e., Message I, Phase I, had a range of 109, while for Message I, Phase II, the range was 146.

For Phase II, differences between the highest and lowest scores, suggest that the more "disorganized" a message, the less variability exists between individual performances. However, the reverse was true for Phase I. This condition appears to indicate the earlier conclusion, that Phase II subjects were more homogeneous with respect to their attitude towards the experimental task.

The following discussion is connected with Phase II of this investigation which was conducted as a result of the apparent uncontrolled variables which may have affected the data obtained from Phase I.

Phase II

Phase II employed revised procedures in connection with the instructions and subjects. The instructions are recorded on page 24. The sixty high school subjects were highly cooperative and seemed to look upon the experiment as another competitive speech event; the subjects had been competing for trophies in a variety of speech activities during a three week speech camp. The experiment had been introduced as part of the program of activities. An analysis of the data gave results consistent with the experimental hypothesis: the highly organized message transmitted the most information; the moderately organized message transmitted less

information; and the least organized message transmitted the least information.

The data from Phase II, as distinguished from that of Phase I, was probably the result in part, of employing a more homogeneous group of subjects with respect to interests, attitudes, and "motivational" factors.

An additional analysis of data between male and female scores, although not an objective of this investigation, indicate that female subjects performed more accurately than males in reproducing the visual display which they heard described. This difference was statistically significant. To the degree to which the task of the present investigation corresponds to language skills and development, the results of male and female differences tend to support results of studies reported by McCarthy,³⁶ Templin,³⁷ and Schuell.³⁸

McCarthy observed that "one of the most consistent findings to emerge from the mass of data accumulated to date on language development seems to be a slight difference in favor of girls in nearly all aspects of language that have been studied."³⁹ Templin, with some reservations, states that "girls tend to receive higher scores more frequently than boys, but the differences are not consistent and are only infrequently

³⁶McCarthy, Manual of Child Psychology, p. 551.

³⁷Templin, Certain Language Skills in Children, p. 145.

³⁸Schuell, "Sex Differences in Relation to Stuttering," p. 295.

³⁹McCarthy, p. 551.

statistically significant."⁴⁰ Schuell suggests a similar difference between males and females at the high school level. The difference between male and female is relevant to the hypothesis that females excel over males on language comprehension tests, and are considered to be more precise at such tasks as spelling and writing. Research relative to discriminative listening abilities between males and females is perhaps desirable.

The Criterion Test

The criterion test employed for this investigation was a matrix which contained 256 square units. Subjects of the investigation were to reproduce a display on the matrix after listening to a verbal description of the display. Results of data received from two phases of this study indicate that subjects listening to an organized message, reproduce more of the display than subjects who listen to a less organized message. The matrix appeared to be useful for recording total information received from a message describing this simple design. Further research is warranted for employing more complex designs on the matrix. It is conceivable that with a larger matrix, larger in terms of the number and dimensions of each unit of the matrix, more complex designs might be investigated. Such designs might more accurately represent objects and other nonverbal events of the world.

The index employed for scoring the matrix displays, was that of scoring Right responses only--i.e., counting a score of one for each correctly placed mark in the display and each correctly placed mark

⁴⁰Templin, p. 145.

external to the display. Scoring Rights only for this "forced choice" test, did not adjust the resultant score for guessing on the part of the subject. Assessing information by this index would only affect the performance score if there were a considerable number of omissions or failures to respond to each square unit of the matrix with one of two marks.

An index which appears to be a more valid assessment of information transmitted, was employed by Basehart.⁴¹ He scored responses of a subject by a "discrimination" and "completion" index. In terms of the matrix criterion, a discrimination score is a ratio of the number of correct responses made in the display over the number of total "shaded in" responses made on the matrix. A completion score is a ratio of correct responses placed in the display over the number of possible responses in the display. Whereas scoring for right responses only gave a "total information received" score, scoring for discrimination and completion would give a more complete picture of the information received.

Another approach to achieving a more meaningful assessment of information received by a subject, would be to provide different weights to the various squares on the matrix. For example, if a subject had placed the vertical figure of the experimental display employed by this writer, on the sixth and seventh square units rather than the eighth and ninth, he would actually receive no information if the matrix was scored by Rights only. However, the subject did receive some information from

⁴¹Jack Basehart, "Communication Effectiveness as a Function of Time Restriction," (unpublished Master's Thesis, Dept. of Speech, Montana State University, 1963), chapters 2 and 4.

the message as is evidenced by the vertical column, two units wide. An index which allowed for weightings of the units on the matrix would thereby provide a more accurate picture of the type of information received.

Providing weights to different responses on the matrix is desirable in the following illustration also. If a subject places a three by three square in the upper left hand corner of the matrix, and is also informed by the message that there is a sequence of three by three squares running on a diagonal from left to right, it appears plausible that more weight should be placed upon the responses in the three by three square in the upper left corner than those responses made for the other four, three by three squares.

As can be seen from this discussion, further research is highly desirable in testing various indices for scoring information produced nonverbally on a matrix.

Sentence Randomization

Statements of fact about the display recorded in Fig. 1, were arranged in such a way as to obtain a message which would be considered initially organized in terms of the organizational model developed in Chapter I. The resultant relationships among sentences were consistent with certain hypotheses of visual perception theory as described in Chapter II. Sentences of this "highly organized" message were then randomized by sets of four sentences each and by individual sentences, which showed a progressive loss in the amount of information transmitted.

The procedure described in the previous paragraph is completely disregarded (except for consistency within a sentence), when each individual sentence of a message is randomized. The habit factor of

perceiving objects from left to right is no longer followed; and the perceptual structure which is indicated by the concepts of proximity and similarity, is "destroyed" in that one sentence may be about the left to right figure, followed by a sentence about a different figure, followed by a sentence about a third figure, etc. However, when sets of four sentences are randomized, some semblance of the perceptual structure exists. For example, Message II, which contains randomized sets of four sentences, is more consistent with the organizational model than individual sentence randomizations, because within each set of four sentences, the relationships among the sentences are consistent with this model. Therefore, consistency exists to some degree among each set of four sentences but then is "destroyed" between the fourth and fifth sentences, and, the relationships among sentences five through eight are again consistent with the organizational model.

For the purposes of this investigation, a message with randomized sets of four sentences, was defined as a moderately organized message; and a message with randomized individual sentences was defined as the least organized message. These methods of designating two levels of organization, appeared to be an experimentally useful procedure in that the individual sentence randomization did transmit less information than the message containing sets of four sentences which were randomized. This method is probably more reliable than employing expert judges to determine levels of organization, in that it would control variables such as fatigue, boredom, and delivery which are likely to bias the decision of the expert judge.

Employing hypotheses of visual perception as an organizational model appears to be a useful method of organizing messages. However

this model may only be generalized to the extent that it is superior to the method of disorganizing the initial message as employed in the study. The organizational model warrants further research. Also, in view of these findings the use of sentence randomization as a method for systematically obtaining levels of organization, warrants further study.

Beighley,⁴² who randomized paragraphs to obtain various levels of organization of a message, concluded that randomizing smaller units, such as words or sentences, would result in nonsense. Depending upon what Beighley referred to when he used the term "nonsense," the present investigation does not appear to support his conjecture; all except five of the thirty-seven subjects listening to Message III of both Phases I and II, received scores significantly above that expected by pure chance.

The Messages

One of the possible factors affecting the differences obtained in the amount of information transmitted by the three messages, is the use of indefinite nouns and pronouns. For example, the phrase "this sequence" at the beginning of the second sentence of Message I, may refer to any of the three sequences or figures of the display when the sentence is taken out of context as randomizing sentences often do. Similarly with the "it" of sentence three and "this square" of sentence five.

If the pronouns and nouns of the paragraph were replaced with nouns or phrases designating definite objects, differences in information transmitted by Messages I, II, and III, may be negligible. Compare the

⁴²Beighley, 1952, p. 258.

following paragraph with the first paragraph of Message I. The nouns or phrases designating a definite object are written within parentheses.

A sequence of (three by three) squares is located on a diagonal running from left to right. This (left to right) sequence begins in the upper left hand corner of the checkerboard. (The left to right sequence) runs towards the lower right hand corner. In the upper left corner is a three by three square. This (three by three) square comprises nine square units of the checkerboard. Four more of these three by three squares are located in this (left to right) sequence. Therefore, in this (left to right) figure there are five associated (three by three) squares. The (three by three) squares of the (left to right) sequence are positioned corner to corner on the (left to right) diagonal. (The three by three squares) run in a stair-step fashion towards the lower right hand corner of the checkerboard. The lower right hand corner does not allow room for a full (three by three) square.

The cumbersomeness in reading and listening to discourse of this nature, makes it unlikely that such messages will be commonly written. Nevertheless, research is warranted in determining whether or not sentences of this nature, when randomized as in Messages II and III, would transmit more factual information about a display than the initial sentences containing indefinite nouns and pronouns. It is conceivable that information transmitted by a message containing sentences with repetitious nouns and phrases would be relatively less affected when the sentences were randomized.

Assessing information transmitted from the above revised paragraph of Message I, is parallel to the procedure employed by Beighley.⁴³ Beighley randomized paragraphs of a message and then wrote out a multiple choice test which contained questions taken from individual paragraphs. Each paragraph contained a "unit" of information which was complete in

⁴³Beighley, 1952, pp. 249-58.

itself similar to one of the revised sentences of the preceding paragraph of Message I. Beighley found that employing the method of randomizing paragraphs, resulted in no statistically significant difference between information transmitted by the highly organized message and the message which contained randomized paragraphs.

Results obtained from the procedures which Beighley employed, would perhaps support the hypothesis that the paragraph, as revised above, would transmit as much information when the sentences are randomized as it would when they are organized in their present form.

Examining Message I further, it is observed that another form of repetitiveness or redundancy is inherent. In the original form of paragraph one of Message I, sentences 1, 4, 6, and 9 contain facts about all the characteristics of the figure which runs from left to right in the experimental display. Sentences 2, 3, 5, 7, 8, and 10 do not contain any additional information about the characteristics of the figure. A similar analysis can be provided concerning the other two paragraphs of Message I.

All of the facts about characteristics of the figures in the visual display of Fig. 1, are reported in the following sentences of Message I: 1, 4, 6, 9, 11, 12, 14, 16, 19, 21, and 24. The message is then reduced to eleven of the initial twenty-four sentences. Would a message containing these eleven sentences transmit as much information as the initial twenty-four sentence message relative to subjects' ability in reproducing the given display?

An investigation conducted by Wason⁴⁴ provides some information

⁴⁴P.C. Wason, "The Retention of Material Presented Through Precis," Journal of Communication, 12 (March, 1962), pp. 36-43.

relevant to the above question. He reports that information retained from a precis of 500 words is considerably less than information retained from the original manuscript of 2000 words. The precis contained only the main assertions and salient points of the discourse. Wason suggests that the reduction of information from the precis is probably due to the necessity of subjects' attention to shift sharply and rapidly in order to gain maximum information.

The difference between Wason's study and the message as revised in the form of the paragraph written above, is that Wason retained only those salient points of the original whereas all points would be retained in the revised message.

The preceding discussion suggests the necessity of further investigation of variables such as organization, repetition, and redundancy, as related to information transmission.

Summary

Results of the present investigation indicate that as the level of organization increases, the information transmitted by the message also increases. This conclusion is consistent with results reported by Smith⁴⁵ and Thompson,⁴⁶ and would likely be consistent with results reported by Darnell⁴⁷ as well as Beighley⁴⁸ if questions from Beighley's information test were not constructed from single paragraphs of his experimental message.

⁴⁵Smith, p. 301.

⁴⁶Thompson, p. 69.

⁴⁷Darnell, p. 100.

⁴⁸Beighley, 1952, p. 58.

Two factors suggest the difference obtained between Beighley's investigation and the present investigation. The first factor is discussed in the preceding section of this chapter. Beighley constructed a multiple choice test by making up question-answer combinations from each paragraph of his experimental message. He then randomized the paragraphs of the message which did not randomize the specific factual information required to answer a given multiple choice question.

A second factor which is suggestive of the different results obtained, concerns the criterion tests employed. The multiple choice test employed by Beighley, assessed a subject's ability to answer a question; the answer or correct response to the question is affected by the subject's ability to recognize the correct response from four possible alternatives. Thurstone indicates that a subject "might very well select properly when the task calls for recognition among given alternatives,"⁴⁹ such as on a multiple choice test. However, when a subject must recall information, such as listing all salient points of the message, or reproducing a display on a matrix as with the present criterion, chance factors and not recognition factors influence the subject's correct response. Further research is warranted relative to assessing information transmission by criteria which are affected by a subject's recall ability, and by criteria which are affected by a subject's recognition ability.

The results of the present investigation indicate that assessing information transmitted by a message by means of a subject's nonverbal

⁴⁹L.L. Thurstone, "The Reliability and Validity of Tests," Microfilm 1, (Ann Arbor, Michigan: Edwards Brothers, Inc., 1939), 72.

response, supports results reported in previous investigations which employed verbal criteria. Basically, all experimental research on the concept of organization as conceived in this study, supports the hypothesis that the amount of information transmitted increases as the level of organization of a message increases.

A summary of the procedures and results obtained from this investigation is reported in the following chapter. Tentative conclusions drawn from the results of this study, warrant further investigation.

CHAPTER V

SUMMARY AND CONCLUSIONS

The central purpose of this investigation was to examine the factor of organization as it relates to the transmission of information in the process of communication. The hypothesis governing the study stated that a more highly organized message would transmit more information than a less organized message.

A message was considered "highly" organized when statements about a visual display were organized in a manner consistent with certain hypotheses of visual perception--i.e., principles of proximity, similarity, good continuation, plus the habit factor of reading from left to right. Sets of four sentences of the initial message were randomized to obtain a "moderately" organized message; and individual sentences were randomized to obtain the "least" organized message. Three groups of subjects listened to the three taped messages under conditions of Phase I and three more groups listened under conditions of Phase II. Phase II differed from Phase I with respect to a revision of instructions and employing high school male and female subjects rather than undergraduate college male subjects. Subjects of Phase II were also more homogeneous with respect to motivational factors, age, and interests. All subjects were asked to reproduce the visual display as described by the message.

A behavioral criterion was used to evaluate the amount of information transmitted by the messages. The degree to which a subject was informed was assessed by counting the number of correct responses

made in attempting to reproduce the visual display. Correct responses were "shading in" a square which was part of the display and "marking a zero" in a square which was external to the display. The hypothesis was confirmed.

Results obtained employing a nonverbal criterion support results reported by previous investigators who employed verbal criteria. Employing hypotheses of visual perception as an organizational model appears to be a useful method of organizing messages but warrants further research. The method of randomizing sentences provides an experimentally useful procedure by which a message may be "disorganized."

From the Phase II experiment, females received more information than males. This difference is relevant to the hypothesis that females excel over males on language comprehension tests, and are considered to be more precise at such tasks as spelling and writing.

The following tentative conclusions are suggested by the data subject to the specific conditions and operations employed:

- (1) As the level of organization in a message increases, the amount of information transmitted also increases.
- (2) Females tend to achieve higher scores than males when assessed for information received from listening to a message.

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APPENDICES

APPENDIX A
The Data Sheet

The Data Sheet

Name _____ Sex _____ Age _____

Address _____

Telephone _____ Date of Birth _____

Place of Birth _____

Year and Major in College _____

Do you have any problems with hearing? If so, describe: _____

Experimenter's comments: _____

APPENDIX B

PHASE I: Individual Performance Scores for Three
Groups Listening to Three Levels of
Organization of a Message

TABLE I

PHASE I: Individual Performance Scores for Three
Groups Listening to Three Levels of
Organization of a Message

Message I	Message II	Message III
Highly Organized (N=13)	Moderately Organized (N=15)	Least Organized (N=17)
256	256	216
255	229	215
252	194	213
239	193	212
225	189	205
224	178	191
220	178	188
218	176	188
195	170	185
188	170	180
182	165	171
163	163	168
147	150	167
	149	160
	139	98
		98
		98

APPENDIX C

PHASE II: Individual Performance Scores for Three
Groups Listening to Three Levels of
Organization of a Message

TABLE II

PHASE II: Individual Performance Scores for Three
Groups Listening to Three Levels of
Organization of a Message

Message I	Message II	Message III
Highly Organized (N=17)	Moderately Organized (N=20)	Least Organized (N=20)
256	217	198
256	216	197
256	216	196
255	212	190
255	207	188
255	202	187
254	196	187
252	194	185
234	192	183
222	188	180
205	185	177
200	183	171
194	182	170
170	180	169
167	175	169
165	174	166
110	171	166
	169	158
	163	145
	157	98

APPENDIX D

PHASE II: Individual Performance Scores from Males
and Females Listening to Three Levels
of Organization of a Message

TABLE III

PHASE II: Individual Performance Scores from Males
and Females Listening to Three Levels
of Organization of a Message

Males (N=33)	Females (N=24)
256	256
256	255
255	254
255	252
222	234
216	217
216	212
205	207
200	202
198	196
197	190
196	187
194	187
194	185
192	183
188	180
188	174
185	171
183	170
182	169
180	169
177	166
175	166
171	145
170	
169	
167	
165	
163	
158	
157	
110	
98	